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EXAMINER

KIM, DAVID S

ART UNIT PAPER NUMBER

2633

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/232,119

Applicant(s)

WEITZEL, THILO

Examiner

David S. Kim

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 21-55 is/are pending in the application.
- 4a) Of the above claim(s) 24-26, 29, 31, 32, 35-37, 46-49, 51 and 52 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 50 is/are allowed.
- 6) ☒ Claim(s) 21-23, 27, 28, 30, 33, 34, 38-43, 45 and 53-55 is/are rejected.
- 7) ☒ Claim(s) 44 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 November 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 13 December 2005.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### Election/Restrictions

1. Applicant's arguments, filed on 21 November 2005, regarding withdrawn claims 24 and 31 have been fully considered but are not persuasive.

**Regarding claim 24**, Applicant states,

"Claim 24 recites presence of a local light source. None of the embodiments illustrated in Figs. 2-4 include a local light source, so Claim 2 is generic to all these embodiments and should be examined at this time" (p. 25, 1<sup>st</sup> paragraph, emphasis Applicant's).

However, the lack of a limitation in multiple embodiments does not logically lead to the generic *inclusion* of this limitation in these embodiments. Rather, since Figs. 2-4 all lack a local light source, they generically *exclude* a local light source in each of their respective embodiments. Accordingly, Applicant's argument regarding claim 24 is not persuasive, and claim 24 remains withdrawn.

**Regarding claim 31**, Applicant states,

"Claim 31 recite presence of a wavelength-dependent element, i.e., a spectrally dispersive or diffractive element which is a frequency or phase modulator at the same time. The dispersive element in the interferometric setup according to the present invention can be a prism 12 (Fig. 2) or grating 11 (Fig. 3). Accordingly, Claim 31 also reads upon the elected embodiment of Fig. 2 and should be examined at this time" (p. 25, 2<sup>nd</sup> paragraph, emphasis Applicant's).

First of all, discussion of this claim is restricted to Fig. 2 in view of the election of the embodiment in Fig. 2 on 19 July 2004. Accordingly, Applicant's point infers that a prism corresponds to the following limitation in claim 31: the wavelength-dependent element that is simultaneously at least one of (a) a frequency shifter, or frequency modulator and (b) a phase shifter or phase modulator. Although a prism is a wavelength-dependent element, it is not generally known to be a frequency shifter, a frequency modulator, a phase shifter, or a phase modulator. Moreover, as previously noted in the previous Office Action (mailed on 17 May 2005, p. 2), Fig. 2 itself does not show prism 12 to be a frequency shifter, a frequency modulator, a phase shifter, or a phase modulator. Accordingly, Applicant's argument regarding claim 31 is not persuasive, and claim 31 remains withdrawn.

**Summarily**, the restriction requirement is still deemed proper and is therefore made FINAL.

**Drawings**

2. Applicant's compliance with the objections to the drawings in the previous Office Action (mailed on 17 May 2005) is noted and appreciated. A replacement drawing sheet for Fig. 2 and a new sheet for Fig. 5 were received on 21 November 2005. Fig. 2 is approved. Fig. 5 is disapproved. Fig. 5 shows structural details of a coupler and a fiber, but these structural details and this fiber is not taught in the disclosure. As a remedy, Examiner respectfully suggests replacing the coupler and fiber of this Fig. 5 with a generic box indicating the coupler in replacement drawing sheet for Fig. 5.

3. Additionally, Applicant's amendments to the claim and the drawings overcome most of the previous objections to the drawings. However, the drawings are still objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the following limitations must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

**(claim 41)** "A device in accordance with claim 21, which is an optical receiver or *spectrometer*."

A spectrometer is not shown.

4. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### **Specification**

5. Applicant's compliance with the objections to the specification in the previous Office Action (mailed on 17 May 2005) is noted and appreciated. Applicant's amendments to the specification overcome most of the previous objections to the specification. However, the disclosure is objected to because of the following informalities:

On p. 8, last full paragraph, "modulation of...wavelength" is used where -- modulation of...frequency -- may be intended. This last full paragraph discusses various modulation schemes, such as modulation of amplitude and relative phase position. Although wavelength does correspond inversely to frequency, "modulation of frequency" (i.e., frequency modulation) is the standard terminology used. Although "modulation of wavelength" may be technically permissible, it is extremely uncommon.

Appropriate correction is required.

6. The abstract (filed on 13 May 2002) of the disclosure is objected to because of its undue length. Correction is required. See MPEP § 608.01(b).

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of **50 to 150 words**. It is important that the abstract not exceed **150 words** in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

### **Claim Objections**

7. Applicant's compliance with the objections to the claims in the previous Office Action (mailed on 17 May 2005) is noted and appreciated. Applicant's amendments to the claims overcome the previous objections. However, objections to the claims still remain.

**Claims 22-23, 41, and 53-55** are objected to because of the following informalities:

**In claim 22**, "aligning the optical signal carrier" is used where -- aligning an optical signal carrier -- may be intended. Otherwise, antecedent basis is unclear and indefinite. Also, "directs the signal" is used where -- direct the signal -- may be intended for grammatical reasons.

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**In claim 23**, “and of a frequency shifter” is used where -- and a frequency shifter -- may be intended.

**In claim 41**, in view of Applicant’s comments regarding claim 41 (filed on 21 November 2005, p. 26-27, bridging paragraph), “which is an optical receiver” is used where -- wherein said detector is an optical receiver -- may be intended.

**Claim 53** is a dependent claim of parent *claim 21*. However, claim 21 discloses a device for detecting optical signals. Applicant may have intended to arrange claim 53 to be a dependent claim of *claim 22*. That is, claim 53 discloses an optical *modulator*, and claim 22 discloses a device for generating optical signals by *modulation* of optical carriers.

**In claim 54**, “each said channel designating by a respective wavelength” is used where -- each of said channels designated by a respective wavelength -- may be intended.

**In claim 55**, “an interferometer as said means” is used where -- an interferometer as said means structured and arranged for aligning -- may be intended. Otherwise, antecedent basis for “said means” may be unclear. Also in claim 55, “superposition” is used where -- interference -- may be intended. Otherwise, antecedent basis may be lacking. Additionally, “said spectrally dispersive element” is used where -- said wavelength-dependent element -- or -- a spectrally dispersive element -- may be intended. Otherwise, antecedent basis is lacking.

Appropriate correction is required.

**Claim Rejections - 35 USC § 112**

8. Applicant’s response to the rejections of the claims under 35 U.S.C. 112 in the previous Office Action (mailed on 17 May 2005) is noted and appreciated. Applicant’s amendments to the claims and arguments overcome the previous rejections under 35 U.S.C. 112. However, Applicant’s amendments to the claims also introduce new issues under 35 U.S.C. 112.

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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10. **Claims 22-23, 43, and 45** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In particular, notice the following limitation in independent claim 22 (also found in dependent claims 23, 43, and 45):

“and directs the signal to *a further optical transmission line* where the resulting signal exhibits modulation” (emphasis Examiner’s).

Such a transmission line is absent from the original disclosure. Accordingly, it constitutes new matter.

11. **Claim 45** is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Notice that claim 45 is a dependent claim of parent claim 22, which discloses a modulating device, presumably for transmitting a signal. However, there are limitations in claim 45 that correspond to a detector, presumably for receiving a signal. Such detector limitations are:

“another mirror pivotally provided to select the wavelength to be *detected*”,

“the *detector* structured and arranged to integrate intensity over the entire cross-section of the ray to be detected”, and

“a lock-in amplifier as the *demodulator*” (this also lacks antecedent basis in parent claim 22). The original disclosure does not disclose these limitations as part of the embodiment for modulating optical carriers. Accordingly, they constitute new matter.

As a remedy, Examiner respectfully suggests changing the claim language. Some suitable language could include the following:

“another mirror pivotally provided to select the wavelength to be ~~detected~~ modulated”,

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~~“the detector structured and arranged to integrate intensity over the entire cross-section of the ray to be detected”, and~~

~~“a lock-in amplifier as the demodulator”.~~

12. **Claim 54** is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description and the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The claim(s) also contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In particular, notice the following limitation:

“said device is structured and arranged to allow heterodyne detection of a single optical channel with defined wavelength ***without spatial separation from other optical channels of different wavelength***” (emphasis Examiner’s).

However, notice prism 12 in Applicant’s Fig. 2. According to the general understanding of prisms with such a shape, prism 12 would spatially separate optical channels of different wavelengths from each other. Then, after reflection from mirror 30, these channels would travel back through prism 12. However, due to the initial spatial separation of the optical channels and the angular relationship between prism 12 and mirror 30, any single, detected, optical channel with a defined wavelength would be spatially separated from other optical channels of different wavelengths. Thus, the disclosure does not teach this “without spatial separation” limitation.

Additionally, this “without spatial separation” limitation is not enabled by the disclosure. It appears that the “detection of a single optical channel with defined wavelength” depends on these features of Applicant’s invention: the initial spatial separation of the optical channels and the angular relationship between prism 12 and mirror 30. That is, the “detection” feature of Applicant’s invention ***depends***, at least, on spatial separation of the optical channels. Thus, there is conflict between this operating principle (the spatial separation) of Applicant’s invention in Fig. 2 and the “without spatial separation” language of



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claim 54. This conflict implies a lack of enablement. That is, how could one make and use the invention of claim 54, which lacks “spatial separation”, if the disclosure teaches the inclusion of “spatial separation”?

13. **Claims 54-55** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Notice that claims 54-55 include “**heterodyne**” detection. However, the discussion of the embodiment of Fig. 2 (e.g., p. 10, 1<sup>st</sup> paragraph) does not expressly disclose “heterodyne” detection. Consideration of the technical aspects of Applicant’s Fig. 2 leads one to wonder whether or not Applicant’s Fig. 2 actually involves “heterodyne” detection.

First, let us note that heterodyne detection involves the mixing of two electromagnetic waves: one wave has one wavelength/frequency and the other wave has a different wavelength/frequency. This mixing leads to waves of sum and difference frequencies.

Next, let us consider Applicant’s apparatus in Fig. 2. It appears that Applicant’s apparatus in Fig. 2 functions by arranging the mixing, or interference, two electromagnetic waves: (1) the reference light from mirror 20 and (2) a particular portion (i.e., wavelength/frequency) of the spectrum of the light from mirror 30. The reference light has a frequency spectrum that is relatively broadband. The light from mirror 30 has the same spectral (frequency) components as the reference light and is also broadband. However, the particular arrangement of mirror 30 and prism 12 arranges the relevant interference of only a particular portion (i.e., wavelength) of the spectrum of the light from mirror 30 with the broadband spectrum of the reference light. Note that the wavelength of this particular portion (i.e., wavelength) of the spectrum of the light from mirror 30 is **included** in the broadband spectrum of the reference light.

Generally speaking, the “different wavelengths/frequencies” employed in “heterodyne” detection implies that the wavelength/frequency of one wave is **mutually exclusive** of the wavelength/frequency of the other wave. Under this reading of “different wavelengths/frequencies”, Applicant’s apparatus in Fig. 2 does not disclose “heterodyne” detection.

However, perhaps Applicant intends a looser reading of “different wavelengths/frequencies”, which would imply a looser reading of “heterodyne” detection. Such a looser reading could apply to Applicant’s apparatus in Fig. 2. That is, although the “wavelength/frequency” of the reference light from mirror 20 (i.e., the entire broadband spectrum) **includes** the “wavelength/frequency” of the particular portion of the spectrum of the light from mirror 30, these two “wavelengths/frequencies” do **differ** inasmuch as they are not exactly identical. Thus, there would be mixing of two “different wavelengths/frequencies”, which would imply “heterodyne” detection.

If Applicant intends the former, stricter reading of “heterodyne” detection where the wavelength/frequency of one wave is **mutually exclusive** of the wavelength/frequency of the other wave, then the “heterodyne” detection of claims 54-55 constitutes new matter. On the other hand, if Applicant intends the latter, looser reading of “heterodyne” detection, then the “heterodyne” detection of claims 54-55 does not constitute new matter.

Additionally, in the case that Applicant considers the usage of the term “homodyne” to describe the detection of Applicant’s Fig. 2, Examiner briefly notes that such usage would also present possible 112 issues.

That is, “homodyne” detection also involves the mixing of two electromagnetic waves. Both of these waves are of the same wavelength/frequency. The “same wavelength/frequency” of “homodyne” detection implies that the wavelength/frequency of one wave is **exactly** the same as the wavelength/frequency of the other wave. Although the two waves of Applicant’s Fig. 2 both **include** spectral components with the same wavelength/frequency, the spectral profile of these two waves are not the same. Thus, Applicant’s Fig. 2 does not disclose “homodyne” detection.

Moreover, to say that Applicant’s Fig. 2 discloses both “heterodyne” and “homodyne” detection would be a contradiction of terms. That is, “hetero-” has the connotation “different” while “homo-” has the connotation “same”. Simultaneous usage of both of these terms to describe the same system would be confusing to practitioners of the art.

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As a simple remedy, Examiner respectfully suggests the simple removal of this “heterodyne” term and avoidance of the term “homodyne” to avoid all of these 35 U.S.C. 112 issues.

***Claim Rejections - 35 USC § 102***

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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15. **Claims 21, 27-28, 30, 33, 38-39, 41-42, 53, and 55** are rejected under 35 U.S.C. 102(b) as being anticipated by Mertz (U.S. Patent No. 3,469,923) and Hecht et al. (*Optics*, hereinafter “Hecht”). See MPEP 2131.01 Multiple Reference 35 U.S.C. 102 Rejections.

**Regarding claim 21**, Mertz and Hecht disclose:

A device for detecting optical signals, comprising  
means (Mertz, beam splitter 23 in Fig. 5) structured and arranged for generating at least one reference light ray which has at least one of

(i) frequency shift or frequency modulation or both;

(ii) phase shift or phase modulation or both; and

(iii) time displacement (Mertz, relative displacement in time between the signal exiting up from 23 and the signal exiting right from 23),

all (i)-(iii) relating to the optical signal to be detected;

means (Mertz, e.g., mirrors 27 and 33, e.g., interferometer structure) structured and arranged for aligning at least one of the signals and reference light ray(s) such that they can be brought into interference; and

a detector (Mertz, photomultiplier 35) with a demodulator (Mertz, synchronous demodulator 38) being structured and arranged to detect amplitude modulation (Mertz, changes in amplitude in col. 2, l.

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29-53; modulation of line 10 in col. 4, l. 63-69; fringe pattern in col. 6, l. 65-70) of a resulting signal from said interference;

wherein a wavelength-dependent (not shown in Mertz but note that Hecht shows compensating plates to be made from glass, p. 287, bottom of col. 1; Hecht shows that glass has an index of refraction  $n$  greater than 1, p. 189-190; Hecht also shows that  $n$  is frequency/wavelength-dependent, p. 38, top of col. 2) element (Mertz, compensating plate 24) is structured and arranged to change angle(s) (not shown in Mertz but shown in the compensating plate  $C$  of Hecht, p. 287, Fig. 9.12) of at least one of the optical signals and reference ray(s) being brought into interference depending upon wavelength; and

said detector (Mertz, photomultiplier 35) is structured and arranged to measure at least one of time and spatial modulation of intensity of at least part of cross-section (Hecht, cross-section on detector  $D$  in Fig. 9.12, p. 287; Mertz, fringe pattern in col. 6, l. 65-70) of the resulting detected signal.

**Regarding claim 27**, Mertz and Hecht disclose:

A device in accordance with claim 21, wherein the wavelength-dependent element is a dispersing optical element (Hecht, light experiences dispersion in the glass of the compensating plate, p. 38, top of col. 2).

**Regarding claim 28**, Mertz and Hecht disclose:

A device in accordance with claim 27, wherein said dispersing optical element is a prism (Mertz, compensating plate 24).

**Regarding claim 30**, Mertz and Hecht disclose:

A device in accordance with claim 21, wherein the wavelength-dependent element is structured and arranged to change type or degree of dependence of angle deflection by the wavelength (Hecht teaches (a) index of refraction  $n$  is frequency/wavelength-dependent, p. 38, top of col. 2; (b) deflection angle is described by Snell's Law, eq. 4.5, p. 63; and (c) Snell's Law is a function of index  $n$ ; thus, the degree of dependence of angle deflection changes based on the wavelength of the incident light).

**Regarding claim 33**, Mertz and Hecht disclose:

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A device in accordance with claim 21, additionally comprising means for deflecting (e.g., glass plate 32 reflects at least some of its incident signal) at least one of the reference light ray and optical signal.

**Regarding claim 38**, claim 38 is an apparatus claim that corresponds largely to the apparatus claim 21. Therefore, the recited means in apparatus claim 21 read on the corresponding means in apparatus claim 38. Claim 38 also includes limitations absent from claim 21. Mertz and Hecht also disclose these limitations:

additionally comprising means (Mertz, lens 36) structured and arranged for changing the ray cross-section of at least one of the rays involved.

**Regarding claim 39**, claim 39 is an apparatus claim that corresponds largely to the apparatus claim 21. Therefore, the recited means in apparatus claim 21 read on the corresponding means in apparatus claim 39. Claim 39 also includes limitations absent from claim 21. Mertz and Hecht also disclose these limitations:

additionally comprising means structured and arranged for providing at least one of spectral filtration, and spatial modulation of at least one of phase (Mertz, displacement of mirror 27) and amplitude of at least one of said rays involved.

**Regarding claim 41**, Mertz and Hecht disclose:

A device in accordance with claim 21, which is an optical receiver (Mertz, Fig. 5 receives optical signal 26) or spectrometer (Mertz, Fig. 5 measures spectral characteristics via photomultiplier 35, spectrographic purposes in col. 3, l. 10-11).

**Regarding claim 42**, Mertz and Hecht disclose:

A device in accordance with claim 21, omitting a local oscillator (Mertz, Fig. 5 lacks a local oscillator).

**Regarding claim 53**, Mertz and Hecht disclose:

A device in accordance with claim 21, which is an optical modulator (Mertz, Fig. 5 modulates an optical signal via displacing mirror 27).

**Regarding claim 55**, Mertz and Hecht disclose:

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The device in accordance with claim 21, comprising, in combination  
an interferometer (Mertz, Fig. 5, notice interferometer structure) as said means,  
means for modulating (Mertz, e.g., displacement components in Fig. 5) one of the rays brought to  
superposition,  
heterodyne detection means constituting said detector (Mertz, photomultiplier 35), and  
said wavelength-dependent element structured and arranged to change angle(s) of rays inside the  
interferometer (not shown in Mertz but shown in the compensating plate C of Hecht, p. 287, Fig. 9.12), or  
a spectrally dispersive element (not expressly stated in Mertz, but Hecht teaches that the beam  
splitter 23 of Mertz is dispersive, p. 287, col. 2, "dispersion of the beam splitter") structured and arranged  
to change angle(s) (Mertz, beam splitter 23 changes angle(s) of impinging rays) of rays inside the  
interferometer.

***Claim Rejections - 35 USC § 103***

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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17. **Claims 34 and 40** are rejected under 35 U.S.C. 103(a) as being unpatentable over Mertz and Hecht.

**Regarding claim 34**, claim 34 is an apparatus claim that corresponds largely to the apparatus claim 21. Therefore, the recited means in apparatus claim 21 read on the corresponding means in apparatus claim 34. Claim 34 also includes limitations absent from claim 21. These limitations are:

the wavelength-dependent element is structured and arranged to be at least one of rotatable or tiltable.

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Mertz and Hecht do not expressly disclose these limitations. However, Examiner notes that one of ordinary skill in the art would have recognized that it is technically trivial to rotate or tilt the compensating plate 24 of Mertz. One simply rotates or tilts it. Accordingly, the compensating plate 24 of Mertz and Hecht would be rotatable or tiltable.

**Regarding claim 40**, claim 40 is an apparatus claim that corresponds largely to the apparatus claim 21. Therefore, the recited means in apparatus claim 21 read on the corresponding means in apparatus claim 40. Claim 40 also includes limitations absent from claim 21. These limitations are:

the wavelength-dependent element is structured and arranged to be at least one of rotatable or tiltable.

additionally comprising at least one of (a) and (b):

(a) wave guides structured and arranged such that at least part of the rays involved are guided at least partially therethrough; and

(b) at least part of the wavelength-dependent element being formed by integrated optics.

Mertz and Hecht do not expressly disclose these limitations. However, Examiner notes that the integration of optics is an extremely well known practice in the art. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to form the wavelength-dependent element by integrated optics. One of ordinary skill in the art would have been motivated to do this for some conventional benefits of integration, such as reduced manufacturing costs, smaller apparatus size, and higher apparatus stability.

### **Epworth**

18. **Claims 22-23 and 43** are rejected under 35 U.S.C. 103(a) as being unpatentable over Epworth (U.S. Patent No. 4,533,247) in view of Hecht.

**Regarding claim 22**, Epworth discloses:

A device for generating optical signals by modulation of optical carriers, comprising

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means structured and arranged for generating (e.g., interferometer structure in Fig. 2a) at least one reference light ray which has at least one of

(i) frequency shift or frequency modulation or both;

(ii) phase shift or phase modulation or both; and

(iii) time displacement (relative displacement in time between the signal exiting down from 20 and the signal exiting left from 20),

all (i)-(iii) relating to the optical signal to be modulated;

means structured and arranged for aligning (e.g., mirrors 21-22, e.g., interferometer structure) the optical signal carrier and at least one of the reference light ray(s) such that they can be brought into interference; and

a coupler (e.g., means to couple output of interferometer in Fig. 2a to optical path 13) structured and arranged to collect a resulting signal from said interference and directs the signal to a further optical transmission line (e.g., optical fiber in col. 2, l. 30) where the resulting signal exhibits modulation;

the device is structured and arranged to make the thus coupled-out signal dependent upon at least one of time (amplitude modulation) or spatial modulation of intensity (changes in intensity in Fig. 6) with reference to at part of cross-section (e.g., interferometers output fringe patterns, which have a cross-section) of the resulting interference signal.

Epworth does not expressly disclose:

wherein a wavelength-dependent element (Mertz, compensating plate 24) is structured and arranged to change angle(s) of at least one of the optical signals and reference ray(s) being brought into interference, depending upon wavelength.

However, Epworth does disclose means for changing refractive index to produce an effective change in the path length (col. 2, l. 38-46, 23 in Fig. 2b). Such means generally imply the use of a medium with a different refractive index than the refractive index of the interferometer environment, i.e., air or free space. Hecht shows a variety of media with material properties that provide differing refractive indices (Hecht, Table 6.2, p. 190). At the time the invention was made, it would have been obvious to one



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of ordinary skill in the art to employ media of such material in Epworth's means for changing refractive index to produce an effective change in the path length. One of ordinary skill in the art would have been motivated to do this since one of most common and inexpensive media for implementing such changes in refractive index is some type of optical glass. An example of the usage of this kind of medium to change refractive index to produce an effective change in the path length is shown by Hecht's compensating plates on p. 287. As this refractive index changing means of Epworth in view of Hecht would have the material properties of some type of glass, it would be wavelength-dependent (Hecht shows that glass has an index of refraction  $n$  greater than 1, p. 189-190; Hecht also shows that  $n$  is frequency/wavelength-dependent, p. 38, top of col. 2) and would change angle(s) (if appropriately placed, e.g., angular placement so that angle(s) change within the refractive index changing means, e.g., as exemplified in the compensating plate C of Hecht, p. 287, Fig. 9.12; such placement is trivially obvious by design choice) of at least one of the optical signals and reference ray(s) being brought into interference, depending upon wavelength.

**Regarding claim 23**, Epworth in view of Hecht does not expressly disclose:

A device in accordance with claim 22, wherein said generating means include a beam splitter and a *frequency* shifter or modulator.

However, notice that Epworth discloses frequency modulation for a related embodiment (col. 5, l. 18-20). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to also employ frequency modulation for the embodiment of Epworth in Fig. 2a. One of ordinary skill in the art would have been motivated to do this since the use of frequency modulation is an extremely common way to transmit information through the field of communications.

**Regarding claim 43**, Epworth in view of Hecht discloses:

A device in accordance with claim 22, omitting a local oscillator (Epworth, Fig. 2a lack a local oscillator).

**Allowable Subject Matter**

19. In a previous Office Action (mailed on 17 May 2005), Examiner indicated allowable subject matter. Applicant's incorporation of some of this allowable subject matter in new **claim 54** is noted and

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appreciated. However, as noted above, Applicant's amendments introduced new ground(s) for rejecting claim 54 under 35 U.S.C. 112.

20. **Claim 50** is allowed. In particular, notice the following limitation:

“a second mirror *pivotally arranged* on a side of said prism opposite said beam splitter to reflect back and *select wavelength* of a signal to be detected” (emphasis Examiner's).

Claim 50 is allowed largely due to the pivoting arrangement of the second mirror for the purpose of selecting the wavelength of the signal to be detected. To further clarify, claim 50 is not allowed simply due to the pivoting arrangement of the second mirror; such a pivoting arrangement for a second mirror of an interferometer is known in the art. For example, see the angular displacement of mirror 70 in Fig. 7 of Epworth and the angular displacement of mirror 80 in Fig. 8, also of Epworth. However, the prior art of record does not show the pivoting arrangement of the second mirror *for the purpose of selecting the wavelength* of the signal to be detected. Accordingly, claim 50 is allowed.

21. **Claim 44** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. See the discussion of claim 50 above for reasons on the allowability of claim 44. That is, claim 44 and 50 both contain similar allowable subject matter.

22. **Claims 45 and 54** would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 1<sup>st</sup> paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

### **Response to Arguments**

23. Applicant's arguments filed on 21 November 2005 have been fully considered but they are not persuasive. Applicant presents several salient points against the rejections under Mertz and Hecht.

**Regarding the first point**, Applicant's argues that Mertz lacks a dispersive element (p. 31, 1<sup>st</sup> paragraph). However, Applicant's usage of the term “a dispersive element” is narrower than the plain meaning of the term. That is, although Applicant's prism 12 constitutes a dispersive element, beam splitter 23 of Mertz and Hecht also constitutes a dispersive element (not expressly stated in Mertz, but Hecht teaches that the beam splitter of Michelson interferometers, like beam splitter 23 in Mertz, is

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dispersive, p. 287, col. 2, "dispersion of the beam splitter"). Accordingly, Applicant's first point is not persuasive.

**Regarding the second point**, Applicant argues that Hecht teaches that any dispersion must be *avoided* and that the Michelson compensator plate is specifically designed *not to change the angle* of the beam. However, Examiner respectfully disagrees. Hecht teaches, "The inclusion of a compensator negates the effect of dispersion", which implies that dispersion is *tolerated* through compensation, *not avoided*, per se. Additionally, notice the *change of angle(s)* of the beam(s) within compensator plate C in Fig. 9.12. Accordingly, Applicant's second point is not persuasive.

**Regarding the third point**, Applicant argues that the reliance of Mertz and Hecht is improper for an anticipatory rejection where a single reference must show all the claimed features. Examiner respectfully directs attention to MPEP 2131.01 Multiple Reference 35 U.S.C. 102 Rejections, which teaches that anticipatory rejections may rely on more than one reference. Accordingly, Applicant's third point is not persuasive.

**Summarily**, Applicant's arguments are not persuasive. Accordingly, Examiner respectfully maintains the standing rejections.

### ***Conclusion***

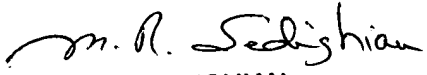
Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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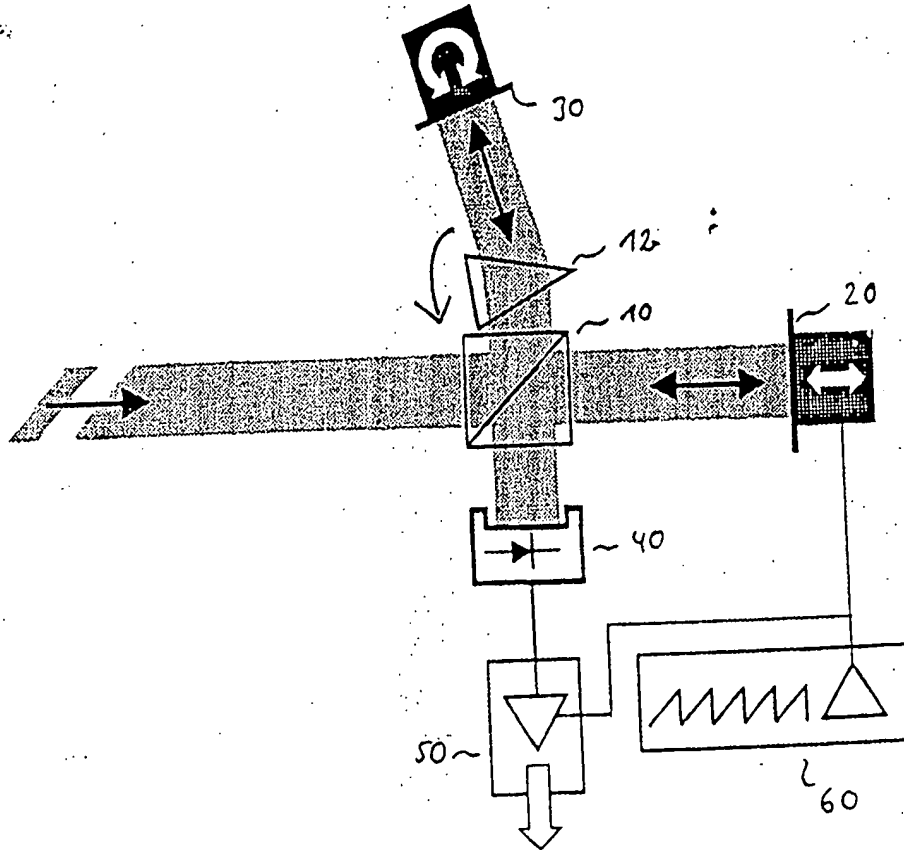
DSK

  
**M. R. SEDIGHIAN**  
**PRIMARY EXAMINER**

# REPLACEMENT SHEET

Approved by DSK  
26 January 2006

Fig. 2



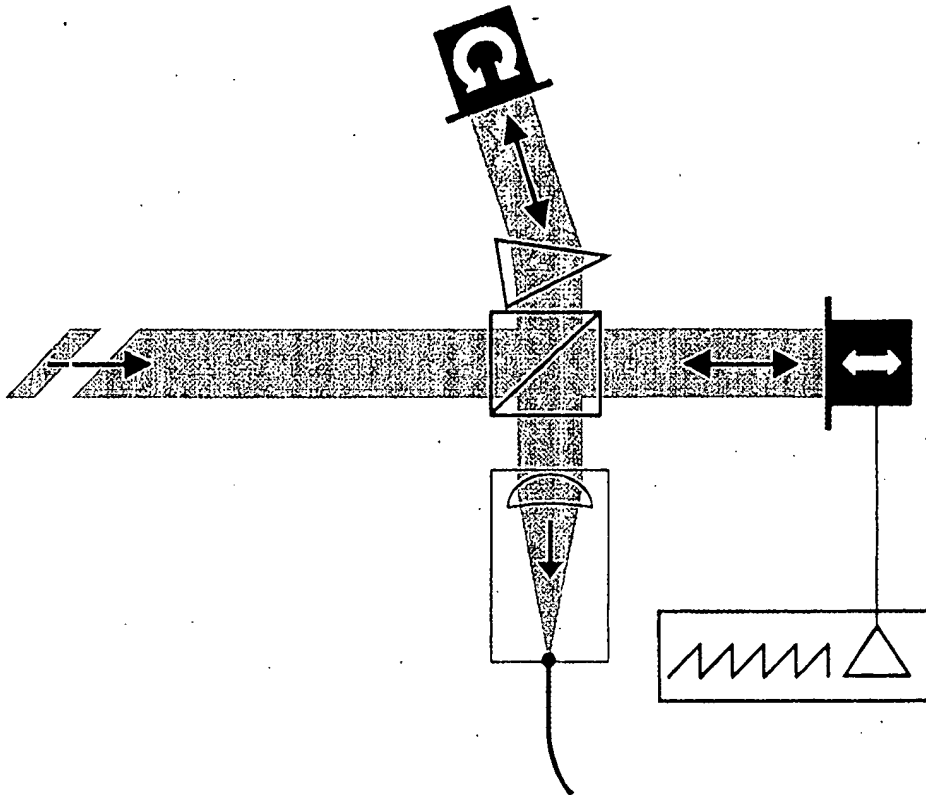
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NEW SHEET

Disapproved by DSK

26 January 2006

Fig. 5, showing the coupler



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